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ABSTRACT

This module on the structure of the microscope is one of 17 modules designed for individualized instruction in health occupations education programs at both the secondary and postsecondary levels. This module consists of an introduction to the module topic, a list of resources needed, and two learning experiences. Each learning experience contains an overview, an objective (e.g., after completing the required reading, identify the parts of the compound microscope and state the functions of each part), and two or three activities (e.g., read the information sheet on the history of the microscope; list, group, and label some additional magnifying objects). Information sheets are generally provided for each activity. To provide feedback to students, a self-check with model answers is included with each learning experience. A student performance assessment form for use by the instructor completes the module. (KC)

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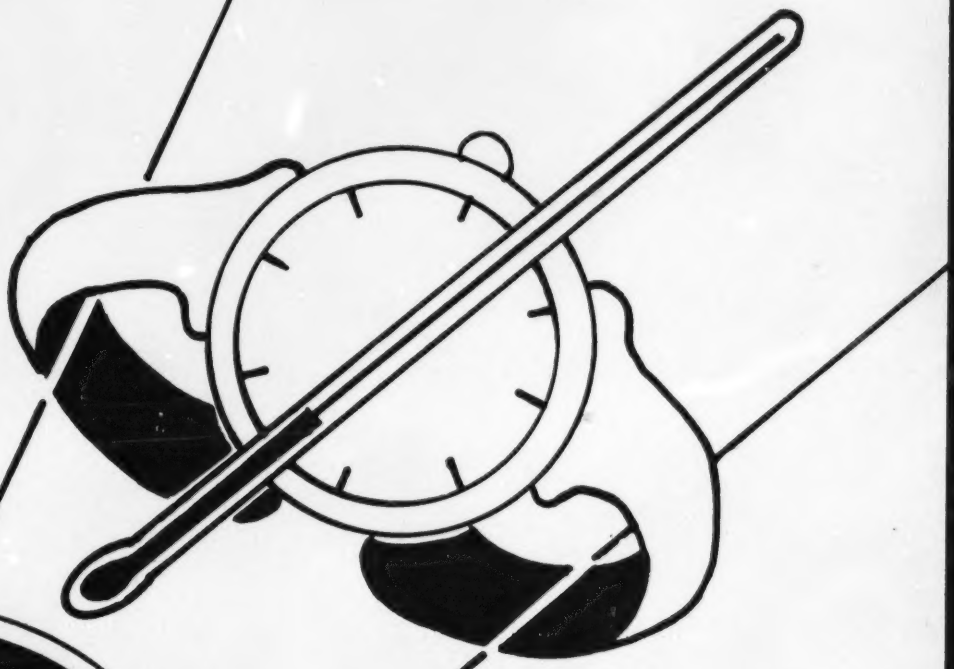
HEALTH OCCUPATIONS EDUCATION MODULE



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THE MICROSCOPE: I - STRUCTURE

2

HEALTH OCCUPATIONS MODULE

designed for the purpose
of individualizing instruction
in the health related occupations
program.

Prepared by...

Temple University of the Commonwealth System of Higher Education

Philadelphia, Pennsylvania

DEPARTMENT OF VOCATIONAL EDUCATION

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The Pennsylvania Department of Education

BUREAU OF VOCATIONAL EDUCATION

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There are no prerequisites for this module.

INTRODUCTION

As a student in Medical Assistant or Laboratory Assistant programs, you will be required to use the microscope. This is one of the most important tools for studying very small objects.

The microscope should be used by the student very early in the course of study. You may already have used a microscope or at least have had the opportunity of looking through one at school. If so, you have some idea of how much more may be seen with the aid of the microscope than with the eye alone. Learning the structure of the microscope is the main purpose of this module.

CONTENTS

Introduction 1

Resources 3

Terminology 4

Learning Experience I

Overview 5

Activity 1
Information Sheet for Magnifying Objects 6

Optional Activity 7

Activity 2
Information Sheet on the History of the Microscope 8

Activity 3
Information Sheet on the Lens 9

Self-Check 11

Feedback: Model Answers 12

Learning Experience II

Overview 13

Activity 1
Information Sheet on the Parts of the Microscope .. 14

Activity 2
Filmstrip 17

Activity 3
Self-Check: Label & Define 18

Feedback: Model Answers 19

Feedback: Student Performance Assessment Form 22

RESOURCES

Listed below is an outside resource which supplements those contained within the module. Check with your resource person to determine the availability and location of the resource.

Recommended Film:

1. Introduction to the Microscope. (SVE filmstrip; 42 frames; #448-1.)

This filmstrip explains the name and function of each part of the microscope.

TERMINOLOGY

"Actual school situation" -- refers to a situation in which you are actually a student in a real school.

"Occupational specialty area" -- refers to your major area of emphasis within the Medical Assistant or Laboratory Assistant programs.

"Peers" -- refers to fellow students who are used to

1) role-play students, etc.,

2) critique your performance, and

3) participate in discussions.

Unless otherwise specified, these peers should be persons in your own occupational specialty.

"Resource person" -- refers to the person in charge of your educational program, the teacher who is guiding you in taking this module.

"You," or "Student" -- refers to the person who is taking the module.

LEARNING EXPERIENCE I

OVERVIEW

ENABLING OBJECTIVE -- Given the information concerning the history of the microscope, describe the difference between using a single lens and a double lens for viewing an object.

ACTIVITY 1 -- Read the "Information Sheet for Magnifying Objects," pp. 6 -7.

OPTIONAL ACTIVITY -- List, group and label some additional magnifying objects.

ACTIVITY 2 -- Read the "Information Shee on the History of the Microscope," p.8.

ACTIVITY 3 -- Read the "Information Sheet on the Lens," pp. 9 - 10.

SELF-CHECK -- Demonstrate your knowledge of the difference between using a single lens and a double lens for viewing an object by completing the "Self-Check," p. 11.

FEEDBACK -- Evaluate your competency by comparing your completed "Self-Check" with the "Model Answers," p. 12.

(Activity 1)

INFORMATION SHEET FOR MAGNIFYING OBJECTS

When we look at something near us we see it at its actual size. If we have difficulty seeing objects we wear glasses. These glasses are lenses in a frame, and they help to correct faulty vision. A lens is a piece of glass or other transparent substance with two curved surfaces, or one plane and one curved surface; it brings together or spreads the rays of light passing through it. Depending on how they are shaped, these lenses can make objects seem larger or smaller.

Let's list some things that make objects seem larger or smaller: (Example 1)

magnifying glass

binoculars

eye-glasses

telescope

a bead

bent piece of glass

chipped piece of glass

clear marble

water

oil

camera lens

(Conclusions)

Depending on how light rays go through an object, these items can make things look larger or smaller. Things used to make objects appear larger or smaller are transparent. They can be in the form of a liquid, such as water or oil, or in the form of a solid, such as a ground lens. Therefore, all the items listed above make things look larger or smaller depending on their shape, distance from the object and their transparency.

(Optional Activity)

In the information sheet you have just read is a list of objects that magnify things that we see. Based on your knowledge, you may want to list some additional items. List them, group them according to their likenesses and differences, and label them according to what they have in common with one another.

Compare your responses in listing, grouping and labeling with those of your peers.

(Activity 2)

INFORMATION SHEET ON THE HISTORY OF THE MICROSCOPE

A Dutch lens-maker, Anton van Leeuwenhoek (1632-1723) invented one of the first microscopes, called a simple microscope. The simple microscope has a single lens that magnifies an object (magnifying glass). It can be used as a hand lens, or it can be mounted on a stand. Using a simple microscope, van Leeuwenhoek discovered one-celled forms of animal life.

Later Robert Hooke, an Englishman, improved the microscope. He used two lenses placed at either end of a tube. The second type of microscope, called a compound microscope, has two separate lens systems. The lens system nearest the specimen is called the objective. The second lens system is known as the eyepiece.

Using a compound microscope to study plant life, Robert Hooke believed he saw the first cell. It reminded him of a jail cell. Actually, he saw only one part of a cell, the cell wall.

The most powerful lens microscope can magnify cells 500,000 times when special techniques are used. The Germans developed the electron microscope in 1937. This powerful microscope uses streams of electrons instead of light rays to magnify objects.

(Activity 3)

INFORMATION SHEET ON THE LENS

Lenses, specially prepared pieces of glass that magnify or enlarge tiny objects, were invented by the ancient Chinese people.

The simplest lens is a single glass lens. It can be used as a magnifying glass.

A lens or magnifying glass is a simple microscope. ("Micro" means small; "scope" means to see.) A microscope is an instrument used to see small objects.

Learning About Lenses

Hold a lens at arms length and look through the lens at some object a few feet away. You will see an image of what you are looking at. The image is formed by the lens.

* Is the image erect (right side up), or inverted (upside down)?
* Does the image appear larger, smaller, or the same size as the actual object?
* What common tools use a lens in this way?

Now hold the lens close to your eye and look through the lens at some object close to the lens (such as your finger).

* Is the image you see erect or inverted?
* Is the image larger, smaller, or the same size as the actual object?

* Which common tool uses a lens in this way?

Now take two lenses. Hold one close to one of your eyes and hold the other at arms length. Close one eye and look through the two lenses at the same object far away. If you don't see anything at first, try moving the farther lens closer to you to bring the image into focus.

* Is the image you see erect or inverted?

* Why does this happen when these two lenses are used together?

* Is the image you see larger, smaller, or the same size as the actual object?

* Why does this happen when these two lenses are used together?

SELF-CHECK

1. Name the Dutch scientist who developed the simple microscope and was the first to observe one-celled forms of animal life.

_____

2. Give the definition of a lens. _____

_____

_____

3. Who was the English scientist who was the first to use a compound microscope to study the cell walls of plants?

_____

4. List four ideas developed in Learning Experience I.

1) _____

2) _____

3) _____

4) _____

5. What are the names of the lenses in a compound microscope?

_____

_____

FEEDBACK: MODEL ANSWERS

1. Anton van Leeuwenhoek was the Dutch scientist who developed the simple microscope and was the first to observe one-celled forms of animal life.

2. A lens is a specially prepared piece of glass that can magnify small objects.

3. Robert Hooke was the English scientist who was the first person to use a compound microscope to study plants.

4. Four ideas developed in Learning Experience I are:

   1) Microscopes use lenses.

   2) Lenses magnify objects.

   3) A microscope using one lens is a simple microscope.

   4) A microscope using two lenses is a compound microscope.

5. The lens system nearest the specimen is called the objective. The second lens system, through which one looks at the specimen, is known as the eyepiece.

LEARNING EXPERIENCE II

OVERVIEW

ENABLING OBJECTIVE — After completing the required reading, identify the parts of the compound microscope and state the functions of each part.

ACTIVITY 1 — Read the "Information Sheet on the Parts of the Microscope," pp. 14 - 15 - 16.

ACTIVITY 2 — View a filmstrip, The Introduction to the Microscope, p.17. This will explain the name and function of each part of the microscope.

SELF-CHECK — Label and define the parts of the microscope indicated in the diagram on p. 18. Fill in the blanks of the "Self-Check."

FEEDBACK — Evaluate your competency by comparing your completed "Self-Check" with the "Model Answers," p. 19 - 20.

(Activity 1)

INFORMATION SHEET ON THE PARTS OF THE MICROSCOPE

Although all microscopes have several features in common, no two microscopes are exactly alike. To use a microscope correctly, you should know its parts and functions.

The microscope used most commonly in schools and colleges for teaching purposes has three parts: 1) the foot, 2) the tube, and 3) the body. The foot is the base on which the instrument stands. The tube contains the lenses, and the body is the upright support that holds the tube.

The body, which is hinged to the foot so that it may be tilted, has a mirror at the lower end. The object lies on the stage, a platform attached above the mirror. The mirror reflects light through an opening in the stage to illuminate the object. The upper part of the body is a slide that holds the tube and permits the operator to move it up and down with a coarse-adjustment gear. This focuses the microscope. Most microscopes also have a fine-adjustment gear which moves the tube a few thousandths of an inch for final focusing of a high-power lens.

The lower part of the tube carries the objective lens. Many microscopes have several objectives with varying powers of magnification. The objectives are mounted on a revolving nosepiece that the operator can rotate to bring the desired lens into place.

The upper end of the tube holds the ocular lens, often called the eyepiece. Microscopes usually have a standard ocular of 10 X and standard objectives of 3.5 X, 10 X and 40 X. Combined with the ocular lens, these give a total magnification of 35 X, 100 X and 400 X, respectively. (10 x 3.5 = 35, i.e., 10 X eyepiece magnification multiplied by 3.5 X objective magnification equals 35 X total magnification.)

The Parts of a Compound Microscope

ARM -- large curved piece of metal that supports the tube and is attached to the base.

BASE -- the bottom part of the microscope. It is weighted to prevent the microscope from tipping over.

CLIPS -- two pieces of spring metal on the stage, which hold the slide in place.

COARSE ADJUSTMENT -- large wheels that move the tube up and down.

COMPOUND MICROSCOPE -- a microscope that uses two lenses (eyepiece and objective).

DIAPHRAGM -- the disk under the stage, used to control the amount of light coming through the hole in the stage. The diaphragm has holes of various sizes. (Some microscopes have an iris condenser instead of a diaphragm.)

EYEPIECE -- contains the lens at the top end of the tube. It is near your eye when using the microscope.

FINE ADJUSTMENT -- small wheels that move the tube up and down. They are used to get the best possible focus after using the coarse adjustment.

MAGNIFYING POWER -- the number of times larger than actual size that an object appears to be when viewed with a microscope.

MIRROR -- a mirror attached to the base, under the stage. It reflects light through the hole in the stage, in order to light the slide. (Some microscopes have an electric light instead of a mirror.)

NOSEPIECE -- at the bottom end of the tube; the objectives are attached to it. It rotates so that different objectives can be used.

OBJECTIVE -- contains the lens at the bottom end of the tube. There may be more than one objective on the microscope. The objective is near the specimen being studied with the microscope. Generally, the lowest power objective is short and wide, and the highest power objective is long and narrow.

STAGE -- the flat area with a hole near the center. The slide is placed on the stage.

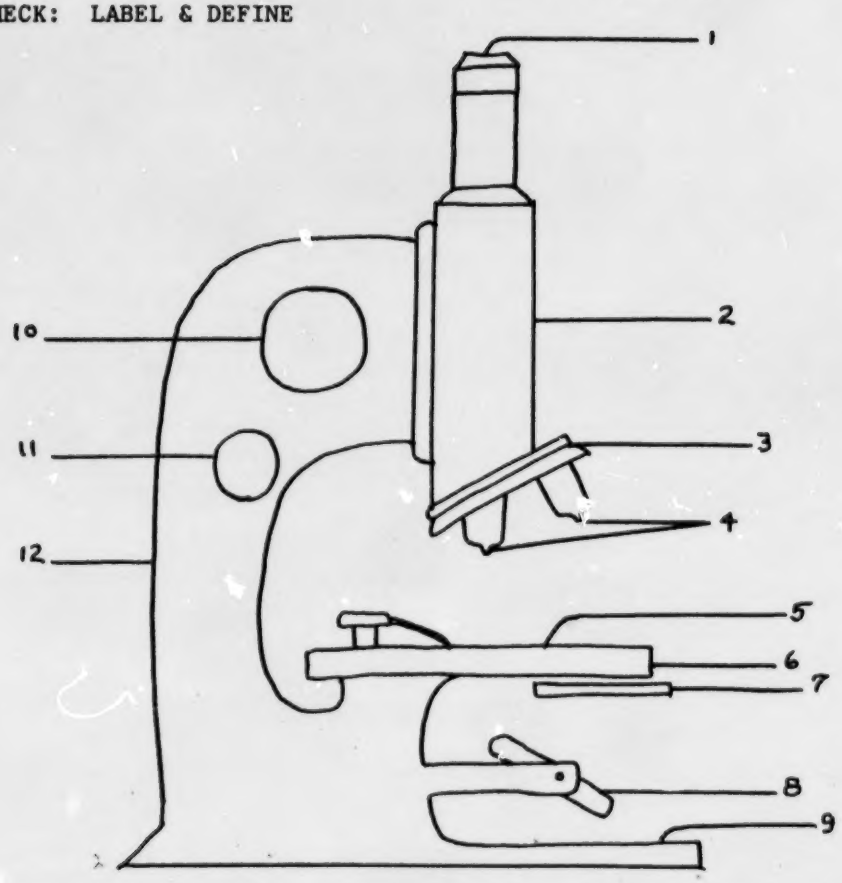
TUBE -- the barrel to which the eyepiece and objective or objectives are attached.

(Activity 2)

FILMSTRIP — Introduction to the Microscope. (SVE filmstrip; 42 frames; #448-1.)

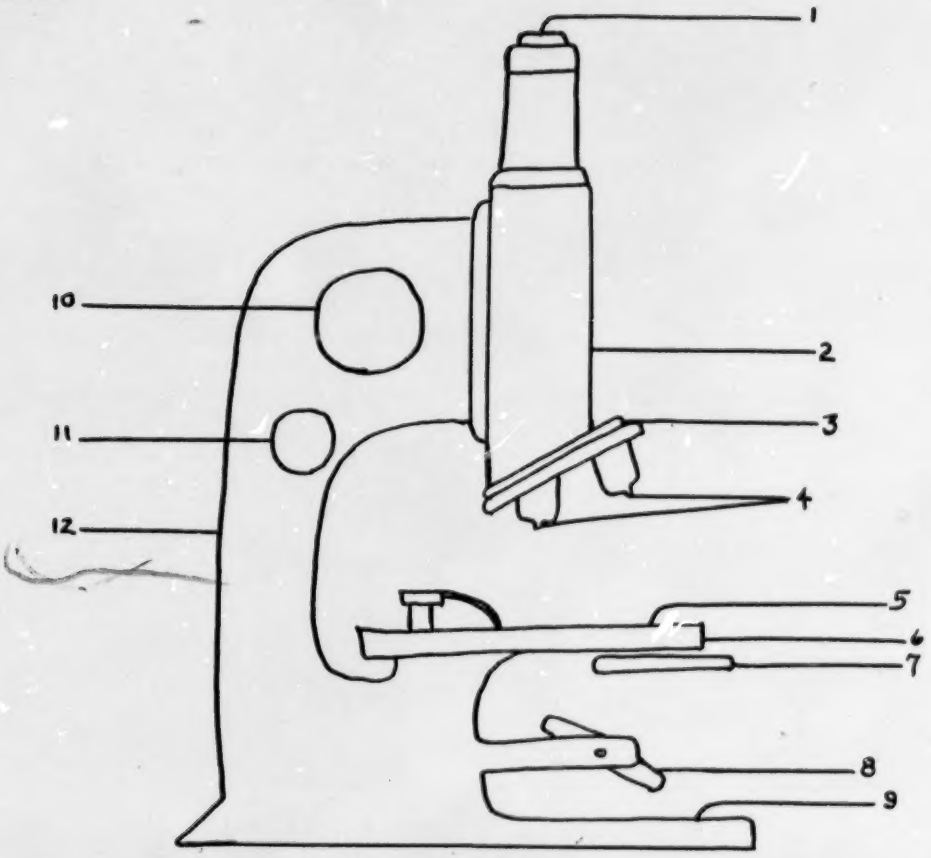
This filmstrip explains the name and function of each part of the microscope.

SELF-CHECK: LABEL & DEFINE



1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____
5. _____ _____
6. _____ _____
7. _____ _____
8. _____ _____
9. _____ _____
10. _____ _____
11. _____ _____
12. _____ _____

FEEDBACK



MODEL ANSWERS

1. Eyepiece -- contains the lens at the top end of the tube. It is near your eye when using the microscope.

2. Tube -- the barrel to which the eyepiece and objective or objectives are attached.

3. Nosepiece -- at the bottom end of the tube; the objectives are attached to it. It rotates so that different objectives can be used.

4. Objective -- contains the lens at the bottom end of the tube. The objective is near the object being studied with the microscope.

5. Clips -- the two pieces of spring metal on the stage, which hold the slide in place.

7. Diaphragm -- the disk under the stage, used to control the amount of light coming through the hole in the stage.

8. Mirror — reflects light through the hole in the stage, in order to light the slide.

9. Base — the bottom part of the microscope.

10. Coarse Adjustment — large wheels that move the tube up and down.

11. Fine Adjustment — small wheels that move the tube up and down. They are used to get the best possible focus after using the coarse adjustment.

12. Arm — large curved piece of metal that supports the tube and its attached base.

STUDENT PERFORMANCE ASSESSMENT FORM

Use of the Compound Microscope

	LEVEL OF PERFORMANCE		
	Satisfactory	Unsatisfactory	N/A
1. Listed the parts of the microscope with 90% accuracy.			
2. Stated the function of each part of the microscope with 90% accuracy.			
3. Carried the microscope from storage place to work area, using the technique given in the directions, with 100% accuracy.			
4. Cleaned the lens and mirror, using the correct technique, within 5 minutes.			
5. Adjusted the light entering the microscope, within 3 minutes.			
6. Placed a prepared slide on the stage.			
7. Using the coarse adjustment, focused the microscope in low-power with 100 % accuracy.			
8. Described the image seen under low-power with 100% accuracy.			
9. Changed the lens to high-power and, if needed, used the fine adjustment to focus, with 100% accuracy.			
10. Described the image seen under high-power with 100% accuracy.			
11. Compared the images seen under low-power and high-power with 100% accuracy.			

STUDENT PERFORMANCE ASSESSMENT FORM

Structure of the Compound Microscope

	LEVEL OF PERFORMANCE		
	Satisfactory	Unsatisfactory	N/A
1. Accurately described the difference between using a single lens and a double lens for viewing an object.			
2. Identified the parts of the compound microscope with accuracy in at least 10 out of 12 instances.			

Instructor's Signature: _____

Instructor's Comments: